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C7E E10X
U1S S1445

(56) Documents cited
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GB 0801004 A GB 0790689 A US 3680705 A

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(54) Water conditioning device

(57) A device (1) as illustrated in Fig. 3 for inhibiting the formation of scale on surfaces contacted by water comprises a through-flow housing (3) having connectors (9) at each end for installing the housing in a water flow system, and a plurality of magnets (19) mounted within the housing (3) in an end to end arrangement along the length of the housing, there being two lines of magnets (20, 21) laterally spaced apart from each other within the housing (3), and at least one holder (11) mounted in the housing (3) and which mounts adjacent ends of two neighbouring magnets of each line of magnets (20, 21). As illustrated the lines of magnets are arranged directly one above the other. Alternatively the lines of magnets are separated horizontally so that, in side view, one magnet is located in front of but spaced from the other magnet.

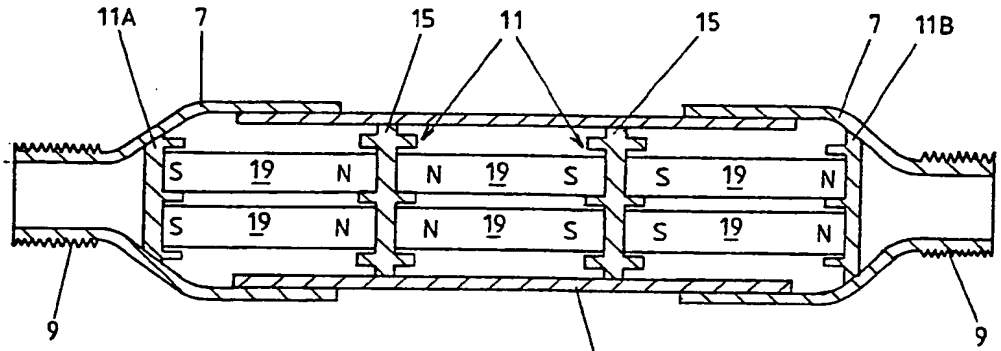

FIG 3

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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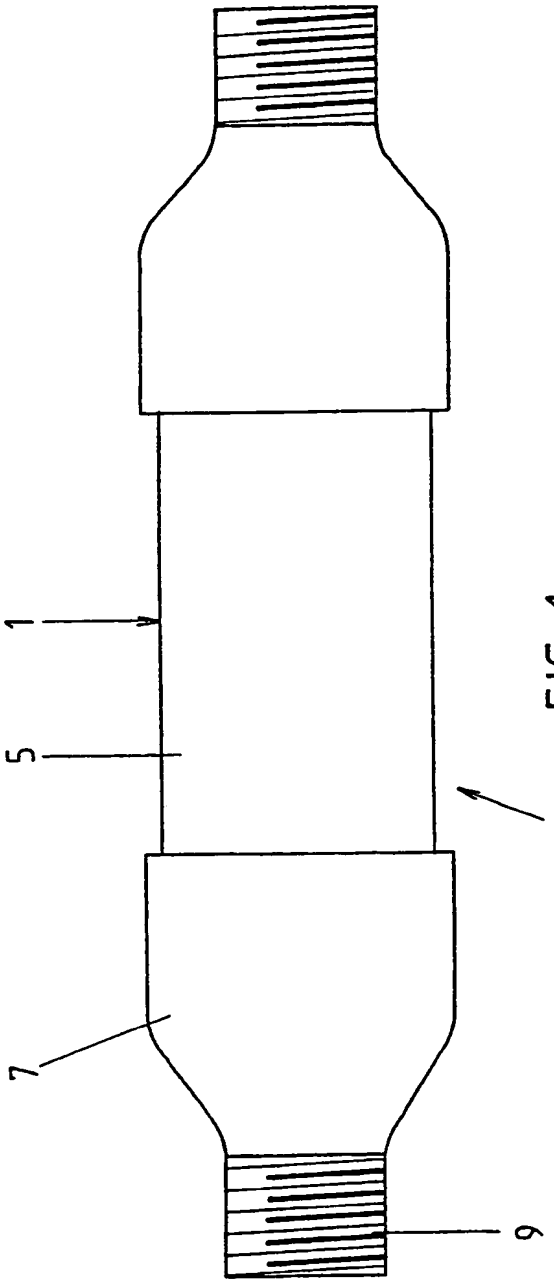

FIG 1

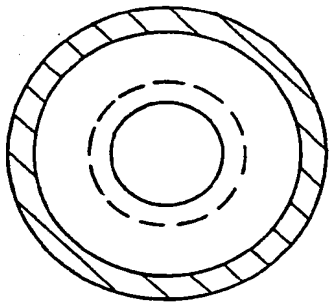

FIG 2

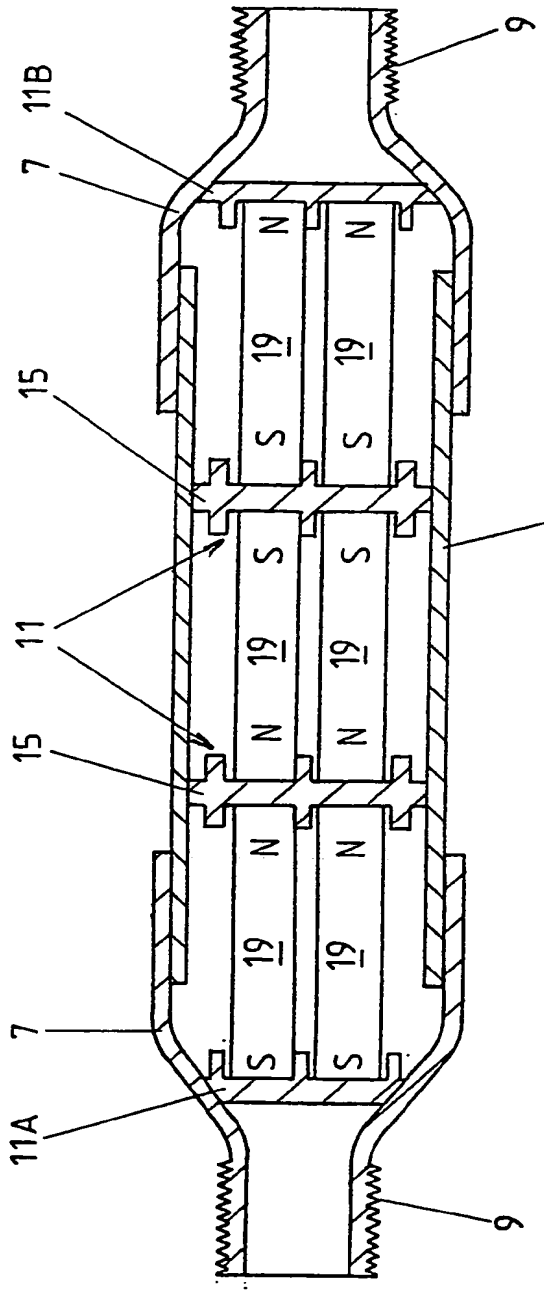

FIG 3

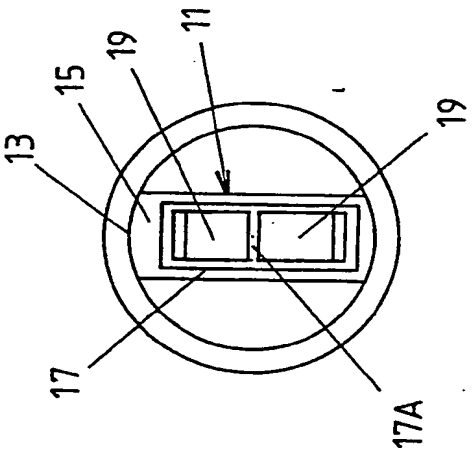

FIG 4

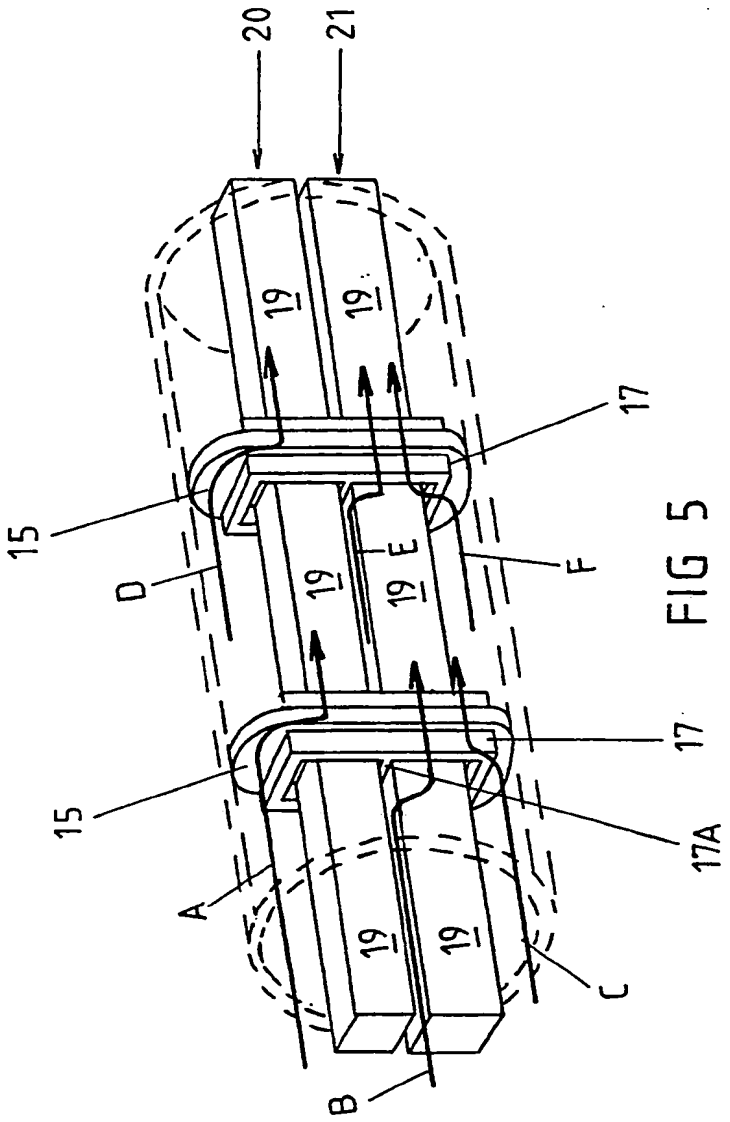

FIG 5

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WATER CONDITIONING DEVICE

This invention relate to devices for conditioning water and in particular to devices for inhibiting or reducing the adhesion of scale to surfaces.

The formation of scale on surfaces is a problem in homes and work places and will occur on the surfaces of, for instance, kettles, irons, washing machines, water heaters, automatic drink dispensing machines, electric showers, self-heat laundry equipment, ice makers and other devices or items of equipment typically found in home and work places. The scale may be, for instance, caused by "hard" water, that is to say, water containing salts of, for instance, magnesium and calcium with precipitates as, for instance, calcium and magnesium carbonate at heat transfer surfaces.

In the applicant's own UK patent GB 2177423B there is disclosed a device for inhibiting the formation of scale on surfaces contacted by water, the device comprising a housing through which water may flow, means for installing the housing in a water flow system, and a single line of magnets mounted within the housing in an end-to-end arrangement along the longitudinal axis of the housing by means of at least one holder lying between two adjacent magnets and accommodating the ends thereof.

The present invention relates to an improvement of the device, which results in increased effectiveness of inhibition of scale formation.

According to the present invention there is provided a device for inhibiting the formation of scale on surfaces contacted by water, the device comprising a through-flow housing, means for installing the housing in a water flow system, and a plurality of magnets mounted within the housing in an end-to-end arrangement along the length of the housing:

characterised in that at least two lines of magnets

are laterally spaced apart from each other within the housing, and in that at least one holder is mounted in the housing and which mounts the adjacent ends of two neighbouring magnets of each line of magnets.

The lines of magnets are preferably separated vertically so that, in side view, one magnet is located directly above but spaced from the other magnet. However, the lines of magnets may alternatively be separated horizontally so that, in side view, one magnet is located in front of but spaced from the other magnet.

If required, each line of magnets may comprise more than two magnets which may be spaced from each other both vertically and horizontally.

Preferably, the through-flow housing is an elongate, substantially cylindrical member.

Conveniently, adjacent magnets are arranged with like poles adjacent in the respective holder.

The holders which mount the magnets within the housing may be plastics holders.

Preferably the housing is made of plastics material which may be, for instance, an ABS plastics.

The magnets may be, for instance, ceramic magnets.

Preferably the housing is formed from a central circular cylindrical plastics member of constant diameter, said member having attached at each end a plastics end member having a circular cross section which diminishes from the end of said second central section in a direction away from said central section to form an end portion of diameter appropriate for connection to the pipe of a water flow system.

An embodiment of the present invention will now be described, by way of example only, and with reference to the accompanying drawings, in which:

Figure 1 is a side elevation of a device in accordance with the present invention:

Figure 2 is a cross section through an end member of

the device of Figure 1;

Figure 3 is a part longitudinal section through the device of Figure 1;

Figure 4 is an end view of the central portion of the device of Figure 1; and,

Figure 5 is a perspective view showing the interior of the central portion of the device of Figure 1.

Referring to the drawings, a device 1 in accordance with the present invention comprises a through-flow housing 3 made of ABS plastics material and having a central circular cylindrical section 5 of constant diameter. Central section 5 has fitted to each end thereof a cap section 7, also made of ABS plastics material, and being of circular cross section. Each cap section 7 has a relatively large diameter portion which is force fitted over the end of central section 5. Cap section 7 diminishes in diameter from just beyond the end of central section 5 to a relatively small diameter portion 9 which is formed with external threads of other formation to enable said narrow end portion 9 to be effectively engaged with the end of a pipe section (not shown) forming part of a water flow system into which the device is introduced. It should be understood, however, that the invention also includes a piece of water-flow equipment in which housing 3 is incorporated as original equipment.

Within housing 3, and in particular within the central section 5, there are mounted two holders 11 made of polyethylene. Each holder 11 is a single plastics moulding of overall elongate rectangular shape as seen in end view and as illustrated in Figure 4. The relatively narrow ends 13 are curved for conformity with the interior wall of the housing 1 and, again as shown in Figure 4, the holder is located within the housing, engaging it with its end walls 13 and leaving relatively large spaces on either side of its relatively long sides for water flow. Two further holders 11a, 11b are located in the ends caps 7.

Each holder 11 has a central flanged section 15 in which are housed the abutting ends of two adjacent magnets 19 of two laterally spaced lines of magnets 20 and 21. Also, on each side of each central section 15 of each holder 11, there is a respective rectangular flange 17 which defines two rectangular frames through which the lines 20 and 21 extend, as can be seen particularly in Figures 4 and 5. The two rectangular frames are separated by a common horizontal frame member 17a. The magnets 19 are preferably ceramic magnets which take the form of elongate slabs of small rectangular cross section, and at least one end of one magnet 19 of each line 20 and 21 is gripped securely within a respective holder 11, though in the illustrated embodiments two holders 11 are provided within the housing 3, approximately equally spaced along its length. In addition, holders 11a and 11b are provided within the cap sections 7 to hold the axially outer ends of the outer magnets 19 of the lines 20 and 21. By way of example only, holder 11a may be arranged at the inlet end of the through-flow housing 3, and holder 11b may be arranged at the outlet of the through-flow housing.

In the illustrated embodiment, each of the lines of magnets 20, 21 includes three magnet assemblies arranged end to end along the longitudinal axis of the housing 3, with the central magnet assembly being held at both its ends by the central holders 11, whereas the two outer magnet assemblies in each line have their inner ends supported within the central holders 11, and their outer ends are supported by and mounted on the holders 11a and 11b.

The number of magnet assemblies making up each line is not critical, and may be more than the three which are illustrated, including four, five, six or more. The magnets are arranged with like poles at each set of ends mounted within a respective one of the holders, as can be seen from Figure 3. The magnets in each line 20, 21 extend

substantially throughout the entire length of the part of the housing having the relatively large diameter i.e. the cylindrical part 5 plus the enlarged diameter parts of the cap sections 7.

In the illustrated embodiment, each block magnet 19 comprises a ceramic magnet, but other embodiments of the present invention may be provided with ferromagnetic elements.

It will be noted from Figure 5 of the drawing that each holder extends throughout the height of the housing, but leaves substantial passages defined between the upright faces of the holder 11 and the adjacent arcuate portions of the housing.

In use, water flows through the housing 3 as indicated by arrows A, B, C and D, E, F in Figure 5, and when the water flowing along the lines A, C, D and F hit the holders 11, the flow is diverted to pass along the passage between the holders and the inner wall of the housing. Similarly, the water flowing between the magnets of each assembly along lines B and E is diverted into the same space. This creates a rippling effect which promotes turbulent flow which enhances the operation of the device.

CLAIMS

1. A device (1) for inhibiting the formation of scale on surfaces contacted by water, the device comprising a through-flow housing (3), means (9) for installing the housing in a water flow system, and a plurality of magnets (19) mounted within the housing (3) in an end-to-end arrangement along the length of the housing:

characterised in that at least two lines of magnets (20, 21) are laterally spaced apart from each other within the housing (3), and in that at least one holder (11) is mounted in the housing and which mounts the adjacent ends of two neighbouring magnets of each line of magnets.

2. A device according to Claim 1, in which the throughflow housing (3) has an inlet at one end and an outlet at its opposite end, and is intended to extend substantially horizontally when installed, characterised in that the lines of magnets (20, 21) are arranged one above the other.

3. A device according to Claim 1, in which the throughflow housing (3) has an inlet at one end and an outlet at its opposite end, and is intended to extend substantially horizontally when installed, characterised in that the lines of magnets (20, 21) are horizontally spaced apart from each other.

4. A device according to any one of the preceding claims, characterised in that each holder (11) includes a rectangular frame (17) which supports respective pairs of adjacent magnet ends.

5. A device according to Claim 4, characterised in that each holder (11) extends continuously throughout the height of the housing (3), and projects laterally of the lines of magnets (20, 21) so as to define obstructions to the passage of water through the housing and alongside the magnets (19), so as to divert the water laterally and thereby promote turbulent flow in the housing.

6. A device according to any one of the preceding claims, characterised in that each holder (11) has magnet ends mounted therein having like poles.

7. A device according to any one of the preceding claims, characterised in that the holders (11) are made of plastics.

8. A device according to Claim 7, characterised in that the housing (3) is made of plastics and the magnets (19) are ceramic magnets.

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